"I think innovation partnerships in our industry are an advantage for the whole process. I'm convinced that our industry makes no progress without this diversification."

Quoted from a small firm manager interview.

Chapter 1: Introduction and Rationale

Innovation is broadly seen as vital for a firm's competitiveness, and ultimately its survival. It is also viewed as the motor of economic progress and development (Schumpeter 1939; Arrow 1962; Drucker 1985; Dodgson, Gann & Salter 2002; Kasza 2004). My research explores innovation in a particular context, drawing on two important frameworks:

- Dosi et al. (1988) identify two key constituents of innovation: cumulativeness and uncertainty. Cumulativeness means that innovation is a learning process resulting in growing skills from a multitude of sources. These sources are by no means constrained to the firm's boundaries. They will inevitably also come from various sources outside of the firm, either through partnerships, licensing, uncontrolled knowledge transfer, or alliances. Uncertainty, on the other hand, means that innovative activities involve the discovery of the unknown, be it in terms of product and processes, as well as, the reaction of the market to the new products. Risk is inherent in innovation. This analysis expands the notion of innovation beyond its strictly industrial and economic meaning, and considers social phenomena. It emphasizes innovation as being uncertain and, hence, fraught with risk. Knight's (1921) and Akerloff's (1970) seminal work showed the importance of uncertainty, and this aspect becomes even more important when the unit of analysis is changed from intra-firm to inter-firm relations, because issues such as dominant logic (Dougherty 1992), and the assimilation and utilization of external knowledge (Cohen & Levinthal 1989) have to be considered.

- The second major strand of thinking is based on the extant literature addressing an important aspect influencing the boundaries of a firm. Coase (1937) argued that make or buy decisions are being made on the basis of transaction costs, and the optimal size of an organisation will stabilize around an equilibrium where the cost of internalising transactions is equal to the cost of organizing externally. Williamson (1975; 1985; 1996) takes a behavioural stance in addition to the traditional economic one, and argues that organisations prefer hierarchical governance to market governance when decisions appear uncertain and unstable, and their outcome is difficult to predict. Organisations could expect more control to downstream adjustments through internal sourcing than through multiple

external contracts and agreements.

Based on this prior work, my research aims to explore the perceived uncertainties and risks in innovation. Specifically, its focus is on how small and large firms address this inherent uncertainty, and the size related advantages and problems they face when pursuing innovation. The required inputs for innovation can and will come from a broad range of sources within and outside of the firm, and my particular interest is the potential complementarities of such unequally sized firms (Arrow 1983; Powell 1987; Ács & Audretsch 1988; Tether 1998; Dalziel 2002). Wiliamsons's transaction cost economics attempt to anticipate if uncertainty leads to sourcing within or outside the organisational boundaries, and I want to test my research results against his assertion.

1.1 Rationale for the research

The market for high technology products has become increasingly competitive by virtue of ever-faster product cycles, the ineffective protection of intellectual property and the constant price erosion. The vicious cycle of rapid technological change results in a self-perpetuating pressure to invent and market new products, a trend particularly agitated in technology driven industries (Dodgson, Gann & Salter 2002). This research was conducted in the western part of Austria, which has been under continued competitive pressure. Local organisations operate with a precipitously high cost structure, making ongoing innovation a necessity. In addition, the rich mix of small and large high-technology firms in the region provides a wealthy source of evidence for investigating innovation partnerships. To my knowledge there is no body of research investigating these questions in this geographic and industrial setting, and my research attempts to fill this gap under the following title:

Innovation partnerships between small and large firms: possibilities and threats

More detailed research questions, which flow from the overall direction of my research, are:

- *What are the sources of uncertainties in innovation for small and large firms?*
- *What are the size related capabilities of and issues faced by small and large firms in the innovation process?*
- *How helpful are innovation partnerships between small and large firms in creating and capturing value?*

- *What circumstances are beneficial or detrimental for innovation partnerships?*

I assume that a firm's management needs a balanced approach between internal and external innovation activities, and is required to understand and be able to exploit potential synergies and complementarities amongst the two approaches. The intention of this research is to make a contribution to an evidence-supported, phenomenological understanding of the complementarities between large and small firms in the innovation process in this specific part of the world. It is an interpretative, qualitative study and does not intend to provide universally valid generalisations.

There is no uncontested conclusion in the literature about whether innovation partnerships between small and large firms are intrinsically valuable or not (Doz 1988; Botkin & Matthews 1992; Forrest & Martin 1992; Tether 1998; Vossen 1998; Mourouti, Cilkin & Dunton 1999), and I want to explore under which circumstances they are seen to be beneficial, or detrimental to one or both partners in terms of competitive advantage, value creation and value retention. My objective is to analyse the perceptions of the interviewed organisations with respect to the critical elements and variables affecting the complex links between internal and external sourcing of knowledge and innovation via partnerships. I hope to foster sensitivity towards the essential conditions that contributed to the successful arrangements researched in this study, and the identified complementarities of small and large firms in the innovation process.

1.2 Why partnerships?

The internal development resources of even the largest organisations are limited and they are forced to seek access to external ideas and technologies through alliances, acquisitions and other forms of cooperation (Doz 1988; Tether 1998; Vossen 1998). The strategic decision of whether to develop innovative products internally or to opt for the acquisition of external knowledge is crucial in maintaining market position (Lindholm 1997). Between these two extremes there is obviously a blend of both, or as Cassiman and Veugelers (2003, p.2) put it, the *'complementarity between these different innovation activities'*. The ability of the most obvious alternatives to partnerships, namely acquisitions, mergers, or equity alliances to create value appears questionable due to:

- High failure rates (Biggadike 1979; Lefkoe 1987; Knowles 1988).
- Divestiture rate (Porter 1987).
- Disappointing returns to shareholders and companies (Jensen & Rubak 1983).

- Decreasing subsequent profits (Ravenscraft 1987).
- Negative implications on workforce motivation (Marks & Mirvis 1985; Walsh 1989).
- The loss of key executives (Schleifer & Summers 1988; Hegarty & Krug 1997).

Even the causal relationship between merger gains and the relatedness of partners has been found as being not significant (Shelton 1988). Kitching (1967) and Porter (1987) claim that three out of four unrelated acquisitions failed, while Elgers and Clark (1980) posit that unrelated mergers outperformed related acquisitions.

Contributions by Pisano (1991), Eisenhardt and Schoonhoven (1996) and Teece (1996a) provide evidence that change and uncertainty[1] lead to an increasing preference for flexible forms of organisation such as alliances. Similarly, Ciborra (1991) predicts that firms requiring a large degree of learning and flexibility, such as high-tech industries, will see a prevalence of alliances, whereas mergers and acquisitions might be more popular in the low-tech sectors of industry where learning and flexibility are less important. These considerations portray innovation partnerships not based on exchange of equity as potentially highly valuable, and my research focuses on these agreements.

1.3 Implications

This research potentially has implications for a wide number of stakeholders:

- Policy makers, such as governments and local authorities, can on the basis of this research, direct their actions accordingly. Indirectly, through providing a supportive legal climate (White & Maurice 1988), and directly in bringing potential partners together and allowing an easy information exchange (Coleman 1998; Asheim 2003). Such innovation networks can take the form of social capital (Fukuyama 1996) that facilitate co-ordination and co-operation for mutual benefit (Putnam 1993). However, they can also be based purely on strategic business relationships and the interference of policy makers could be detrimental (Saxenian 1994). Public involvement to support innovation is occasionally recommended because markets will under invest in such activities primarily because of inadequate appropriability conditions. The policy maker is seen as an optimising social planner aiming to improve the behaviour of firms by correcting imperfect initiatives (Faulkner & Senker 1993; Edquist & Johnson 1997; Metcalfe & Georghiou 1998).

[1] This idea has been pioneered by Knight (1921) who founded the theory of economic organisation with his '*Risk, Uncertainty and Profit*'.

- Managers of small firms might be able to understand better how and in which constellation to enter into relationships. Parameters will be the extent of value creation and capturing from joint innovations through exploiting the mutual strengths (Ács & Audretsch 1990). Small firms can expect increased credibility (Teece 1986), access to capital (Jolly 1997) and advantages through the exploitation of the partner's global marketing and distribution capability (Chandler 1990; Henderson & Cockburn 1996). However, this might also have negative impact on its autonomy (Doz 1988) and the increased bureaucratic burdens (Gomes-Casseres 1997).

- Managers of large firms can become sensitive to barriers in innovation processes (Dougherty 1992), their dilemmas with disruptive technologies (Christensen 1997), the value of research networks (Gomes-Casseres 1996) and the mutual benefits of combined innovation (Fritsch & Meschede 2001). This research might be able to provide some guidelines about how to configure dynamic and focused partnerships (Mourouti, Cilkin & Dunton 1999), and might be helpful in finding alternatives to outright acquisitions (Haspeslagh & Jemison 1991; Laamanen 1997; Inkpen, Sundaram & Rockwood 2000; Bauer 2002). Jeffrey, Prashant and Harbir (2004, p. 112) put it succinctly: *'Knowing when to use which strategy [acquire or alliance] may be a greater source of competitive advantage than knowing how to execute them'.*

- The community of business researchers and practitioners in the field of innovation management might benefit through a better understanding of how product innovation can be pursued in a partnership between large and small firms in this particular industry and geographic context (Scott 2001).

Chapter 2: Literature Review

This literature review covers innovation management from the perspective of either small or large firms, and then looks at the extant research addressing the potential advantages and difficulties of innovation partnerships between small and large firms. To set the scene, the nature and models of innovation are discussed, with a brief investigation of how traditional economic theories attempt to anticipate governance structures. The second section examines the literature tackling size related innovation capabilities and deficiencies. Advantages and disadvantages of small and large firms, and uncertainties associated with their product innovation are reviewed. The last part summarizes what the relevant literature says about how organisations can benefit through value creation and capture from innovation relationships. Conversely, the negative aspects of cultural, strategic, or geographic distance are looked at. Accordingly, the overall structure of this literature review is as follows:

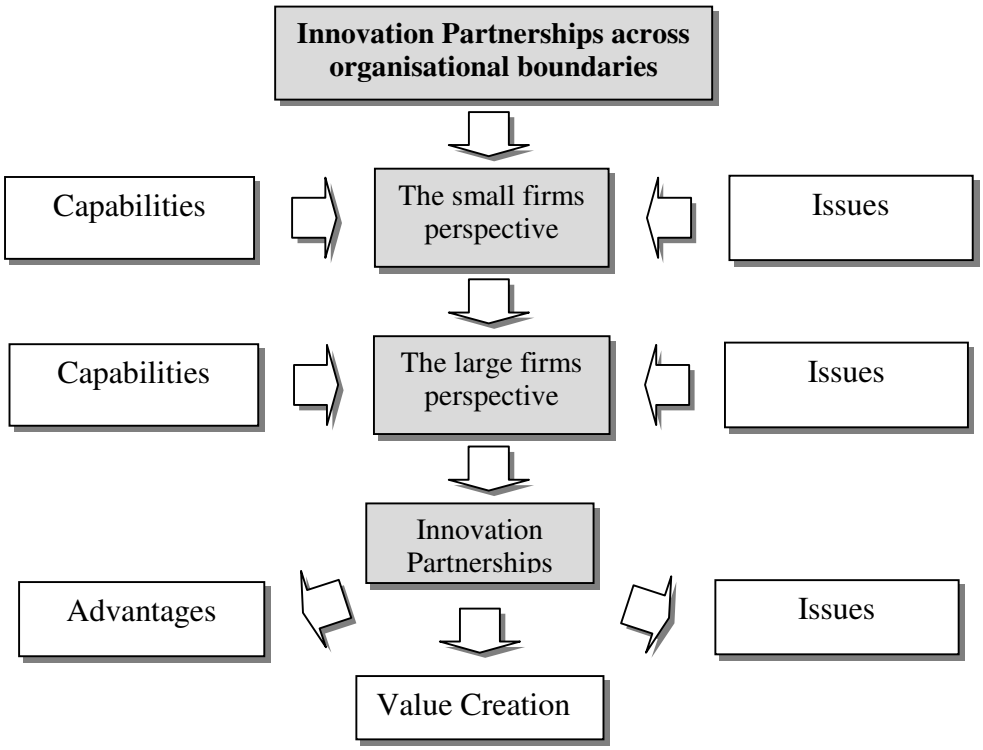

Figure 1: Structure of the literature review

2.1 Importance and sources of innovation

Innovation, and the associated value creation is generally seen a key ingredient for a firm to survive and remain successful (Schumpeter 1939; Arrow 1983; Drucker 1985; Dodgson, Gann & Salter 2002). Moreover, there is a consensus in the management and scholarly literature that change as a result of innovation is the critical element in achieving and sustaining competitiveness (Leventer 1978; Oakey, Rothwell & Cooper 1988; Baldwin 1995). Mansfield (1968), hypothesizes that *'success breeds success'*, and construe a positive impact of innovation success on further innovation activities. Romer (1990) shows that economic output is positively correlated with the flow of new products including both radical and incremental innovations. Relying on innovation output data, Arundel et al. (2003) report a positive and significant relationship between innovation and different measures of firm performance. Haour, Leleux and Volery (2004) posit a correlation between entrepreneurial activity and economic growth with a two to three year time-lag.

In order to better understand and conceptualise the extant research in the field of innovation management, I briefly discuss how writers have attempted to define, typify, and measure innovation. Despite their age, the classic economic theories have still significance in this context, and are revisited towards the end of this section.

The nature of innovation

The etymological core *'novum'* signifies newness in a variety of settings. Thompson (1965) argues that innovation is the generation, acceptance, and implementation of new ideas, processes, products or services in an applied setting. For Jacques and Ryan (1978) it is synonymous with creativity, for others it is simply the early adoption of a new idea (Rogers & Kim 1985). Merritt (1985) sees it as incremental improvements, where innovation does not necessarily have to be a new idea, but merely an approach applied in a new context (Schröder et al. 2000). Dosi et al. (1988, p. 222) define innovation as:

> *"The search for, and a [sic] discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organisational set-ups".*

Dosi et al. then infer two important dimensions of innovation: cumulativeness, indicating the learning processes resulting in growing skills and increasing innovation capacity, and uncertainty as a result of the inherent risk. The latter one has a particularly important influence.

An invention, however, does not necessarily lead on to innovation, as Freeman (1974, p. 7) noted *'an invention is an idea, a sketch or model for a new or improved device, product, process or system'*. The thematic undercurrents in these definitions include novelty, tangible applied outcomes, expected benefit, dynamism, and subjective perception. However, these semantic definitions hinge on different assumptions and the focus on different levels of analysis. A wider conceptualisation considers social innovation as well institutional and policy innovation: *'the successful production, assimilation and exploitation of novelty in the economic and social spheres'* (European-Commission 1995). The main characteristic of innovation is far reaching change, and as its implications can never be fully understood, we can conclude:

> *"There can be no one theory of innovation, as the more we learn, the more we realize that* 'the whole' *remains beyond our grasp."* (Wolfe 1994, p. 406)

Sources and types of innovation

Griliches' (1979) concept of knowledge production function describes how firms engage in the pursuit of new economic knowledge as an input to generate innovative activity. Cohen and Klepper (1996) consider research and development (R&D) as the key input, supported by a large body of empirical work on varying levels of economic aggregation (Leonard-Barton 1995; Sanchez 2001; Baldwin & Hanel 2003). Conversely, firms, industries or regions with little R&D tend to produce only a negligible amount of innovative output (Audretsch 1995). Early on, writers tried to provide a taxonomy of innovation, and Knight (1967) offered a broad four-element schema comprising:

- Product and service innovation.
- Production process innovation.
- People innovation.
- Organisational innovation.

Abernathy and Utterback (1978) simplified this to:

- Product innovation, such as Dyson's vacuum cleaner.
- Process innovation, such as improving the way of making or delivering a product.
- Organisational innovation, such as the improvement of business processes.

Kim and Mauborgne (1997) call the latter *'value innovation'* that seeks competitive advantage